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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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08/811,742 03/06/97 ZHANG

H	0756-1641
EXAMINER	

022204
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MMC2/0914

ART UNIT	PAPER NUMBER
SMITHSONIAN	

DATE MAILED:

09/14/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 08/811,742	Applicant(s) ZHANG ET AL.	
	Examiner Scott A Brairton	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-12, 16, 19, 26-47 and 67-81 ⁴⁸ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5-12, 16, 19, 26-47 and 67-81 ⁴⁸ is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 6th, 2001 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103 (a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5-8, 11-12, 16, 19, 27-48 and 67-81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP '915) in combination with Liu et al. (US '826) and in combination with Kuznetsov (Inst. Phys. Conf.) and in combination with Kumomi.

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Oka discloses a method of manufacturing a semiconductor device for the formation of an active matrix type electro-optical display having a driving circuit portion and display portion comprising the steps of forming an amorphous Si layer on a glass substrate by PECVD (pg. 6, translation), selectively forming a Ni layer (pg. 14, translation) of a thickness of 100-200 Angstroms, on a-Si layer in seed regions outside the regions slated to become TFT active regions, such that Ni does not diffuse into said active regions by abnormal diffusion, therefore the Ni is introduced into the seed regions by solid source diffusion. Thermally heating the Ni at 450 C° (pg. 6, translation) such that the Ni catalyst would diffusion through the semiconductor film forming crystal nuclei near the interface between the metal layer and the a-Si layer. (pg. 7, translation) After diffusion of the catalyst through the semiconductor film the metal layer is removed to prevent abnormal diffusion (i.e. diffusion into the active layer of the TFT as defined pg. 7 of translation). Formation of semiconductor islands (fig. 2b) consisting of a first region and the formation of a semiconductor island consisting of a second region. Examiner previous official notice was not adequately contested, therefore, it is taken as admitted prior art that the formation of semiconductor islands is notoriously obvious in the art in order to provide device isolation.

Kuznetsov teaches that a metal catalyst induced crystallization occurs by lateral diffusion of the metal throughout the a-Si film. In addition, a concentration of Ni⁺ ions to a maximum concentration of about $1.5 \times 10^{20} \text{ CM}^{-3}$. (pg. 191-194) Thus, such a diffusion while not explicitly taught by Oka, is inherent in the process of Oka as a result of the metal induced lateral crystallization. In reference to new claims 76-81, a-Si is then

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thermally crystallized at 550 C°, where the grain nuclei ordinarily form in the seed regions and grain growth proceeds from said seed regions parallel to the substrate surface and TFT charge carrier flow (fig. 5-8). TFTs are subsequently formed in the crystal growth region. Oka does not explicitly anticipate leaving areas of the film amorphous.

However, Liu teaches forming regions of a-Si on Corning 7059 glass and some of the regions were not treated with Ni prior to a low temperature thermal treatment these regions remain amorphous. While a-Si regions which were treated with Ni are crystallized into polysilicon after said thermal treatment (Example 2). Liu teaches the selective crystallization of certain regions is advantageous because it allows simultaneous formation of driver TFTs which require a low leakage current in the amorphous regions (col. 3, lines 10-17).

Therefore it would have been obvious to one of ordinary skill in the requisite art to leave a second region (disposing nickel in contact with a selected region of only the first region of the semiconductor film) of Oka amorphous by not providing a seed region. One of ordinary skill in the art at the time of the invention would have been motivated by Liu's teachings. That is in order to simultaneously obtain driver TFTs of high mobility in the polysilicon regions and pixel TFTs, which require a low leakage current in the amorphous regions. Therefore, Oka would have been motivated to incorporate these teachings of Liu for there disclosed intended purpose.

Kumomi teaches MILE or catalyst enhanced areas crystal growth takes place parallel to substrate (e.g. MILC). It is held, absent evidence to the contrary, that crystal

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growth of Oka would occur by this mechanism as it is a fundamental characteristic of the process. See *In re Best*, 195 USPQ 428 (CCPA 1977) and *In re Fitzgerald*, 205 USPQ 594 (CCPA 1980).

2. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP '915), in combination with Liu et al. (US '826) and in combination with Kuznetsov (Inst. Phys. Conf.) and in combination with Kumomi as applied to claims 5-8, 11-12, 16, 19, 27-48 above, and further in view of Yonehara (US '093) and/or Shibata (US '224 or JP '224).

Oka and Liu lack anticipation for irradiating the polysilicon after the thermal crystallization.

Yonehara and/or Shibata teach the irradiating the polysilicon after a thermal crystallization in order to improve the properties of the film, such as mobility. It would have been obvious to one of ordinary skill in the art to irradiate the polysilicon of Oka and Liu after the thermal crystallization in order to improve its mobility as taught by Yonehara and/or Shibata.

3. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP '915) in combination with Liu et al. (US '826) and in combination with Kuznetsov (Inst. Phys. Conf) and in combination with Kumomi as applied to claims 5-8, 11-12, 16, 19, 27-48 above and further in view of Kuznetsov.

Kuznetsov teaches determining Ni concentration in metal induced crystallized silicon using SIMS (sec. 2)

Therefore, it would have been obvious to one of ordinary skill in the requisite art to test the metal induced crystallized silicon of Oka or catalyst containing material of Oka by SIMS to check for the presence of and to determine the distribution of deleterious metal impurities (Oka, pgs. 10-11 of translation) as taught by Kuznetsov.

Response to Arguments

4. Applicant's arguments filed 6/12/01 have been fully considered but they are not persuasive.

Applicant asserts none of the references teach or suggest the features of dependent claims 76-81 including forming a first TFT using the first semiconductor island, so that the direction of crystallization proceeding coincides with a carrier flow direction of said first TFT. Applicant further asserts that Oka does not teach arranging the TFT in light of the relationship between the carrier flow direction and the crystal growth direction. However, Oka discloses that grain growth proceeds from the seed regions parallel to the substrate surface and the TFT carrier flow in Figs. 5-8. It is inherent that, in order to cause grain growth parallel to the substrate surface and TFT carrier charge flow as disclosed by Oka, the TFT is arranged in light of the relationship between the carrier flow direction and the crystal growth direction.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Brairton whose telephone number is (703) 306-4213. The examiner can normally be reached on M-F, 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-4082 for regular communications and (703) 746-4082 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Scott Brairton
Examiner
Art Unit 2823

sab
September 12, 2001

LONG PHAM
PRIMARY EXAMINER

LONG PHAM
PRIMARY EXAMINER